L O G O F M E E T I N G

SUBJECT: UL requirements for polymeric (plastic) materials for use in electrical equipment.

DATE: September 10, 1996 **PLACE:** 12 Laboratory Dr.
Research Triangle Pk.
North Carolina

DATE OF LOG ENTRY: September 13, 1996

SOURCE OF LOG ENTRY: William H. King, Jr., ESEE

CPSC PARTICIPANT: William H. King, Jr., ESEE

NON-CPSC PARTICIPANTS:

George Fechtmann, Underwriters Laboratories, Inc. (UL)
Raffic Ali, UL
Raymond Suga, UL
Debbie Oates, UL
Ed Schrand, UL
George Stoddard, Canadian Standards Assoc.
John Blair, DuPont/Society of the Plastics Industries, Inc.
Steve Watson, DuPont
M. Aoki, Toshiba Chemical
R. E. Bell, Jr., Dexter Electronic Materials
M. Breza, M.A. Hanna (Monmouth Plastics)
S. J. Harasin, Bayer Corp.
H. Ishiwata, Mitsubishi Engineering Plastics
F. F. Koblitz, AMP, Inc.
R. MacFarlane, Jr., ALM
F. S. Pang, General Electric Co. (GE Appliances)
C. E. Ruiz, Allied Signal
D. J. Wetzig, Geon
J. Griffin, Geon
M. Wituszynski, Carrier UTC
B. Furches, Dow Chemical
I. L. Wadehra, American Plastics Council/IBM
K. White, General Electric Co. (GE Plastics)
Paul Brown, General Electric Co. (GE Plastics)
Jerry Kirshenbaum, Hoechat Celenese

SUMMARY:

Mr. King participated in the scheduled meeting of UL with their industry advisory group for the purpose of discussing topics related to the use of polymeric (plastic) insulating materials in electrical equipment applications.

UL issued a meeting agenda dated August 13, 1996 (copy attached). Topic number 15 on the UL agenda was a proposed revision to the UL Standard 746C submitted by the technical staff of the CPSC. Mr. King's discussion was limited to this topic.

After discussion of topic number 15, and with the concurrence of those in attendance, UL indicated that it would propose the change recommended by the CPSC technical staff.

UL plans to issue a report on all the agenda items discussed at the meeting.

Thermoplastics in Electrical Products
Jac 9706

Underwriters Laboratories Inc.®

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Subjects 746 (94)
(In reply, refer to Subject 746)

1285 Walt Whitman Road
Melville, NY 11747
August 13, 1996

TO: Industry Representatives on the Industry Advisory Group of UL for Polymeric Insulating Materials

M. Aoki
W. G. Baumgardt
R. E. Bell, Jr.
J. Blair
M. Breza
R. Chase
R. E. Evans
R. Fish
B. B. Fitts
R. G. Franke
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Industry Representatives on the Industry Advisory Conference of UL for Basic Plastic Materials

J. A. Blair
D. C. Bonner
B. Furches
G. S. Kirshenbaum
H. J. Moltzan
I. L. Wadehra
K. White

SUBJECT: Industry Advisory Conference/Group Meeting Agenda

As announced in the Subjects 746 (94) letter to the IAC/IAG dated July 3, 1996, a meeting of the Industry Advisory Group of UL for Polymeric Insulating Materials and the Industry Advisory Conference of UL for Basic Plastics Materials is scheduled for:

September 10, 1996
UL's RTP Office
12 Laboratory Drive
Research Triangle Park, NC 27790
(919) 549-1400
Bono A/B Conference Room
9:00 am — 5:00 pm

SUMMARY OF TOPICS

The following topics will be discussed at the meeting:

1. Plastics Steering Committee Update
2. ASTM/IEC/ISO Activities Update
3. Consideration of Increased Generic RTI for PPHOX and Polyetherimide
4. Generic RTI for Two-Part Epoxy (EP) Materials
5. Clarification of Generic RTI for Polypropylene (PP)
6. UL 746B, Table 19.1 — Deletion of Dielectric Strength Testing of "Wet" Samples
7. UL 746B, Table 18.1 — Ad Hoc Committee Update
8. Global Products Classification
9. Downgrading Guidelines
10. Polycarbonate File Review Update
11. Request to Revise UL 94-5V Test
12. Charpy Impact Test
13. UL 746A — Ball Pressure Test in Section 28
14. UL 746C, Table 8.1 — Heat Deflection Temperature
15. UL 746C, Figure 5.1 — Proposed Revision
16. Reference to Laundry and Dishwasher Requirements on the QMFZ2 Guide Information Page
17. Proprietary Plastics Update
18. Revision of QMFZ2 Grey Pages
19. Client Interactive Program
20. UL 94 - Editorial Corrections
21. 94 Flame Rating Designation(s)
22. PLC(S) for Hot Wire Ignition Test
23. Metalized Parts Ad Hoc

Attached is the agenda for the meeting.

Your membership on this conference is on an individual basis. Thus, if you are unable to attend the meeting and wish to propose sending a substitute, or you want to bring another person who can contribute substantially to the discussion, you are requested to contact us for permission to do so. Such a request should be made as early as possible prior to the meeting. This practice is necessary and desirable to ensure the size and effectiveness of the group.

Hotel Accommodations

For your convenience, rooms have been reserved at the Doubletree Guest Suites, 2515 Meridian Parkway, Durham NC 27713, (919) 361-4660 phone, (919) 361-2256 fax, for September 9, 1996. Rooms have not been guaranteed; therefore, should you elect the use of these accommodations, it is suggested that you contact the hotel to confirm your reservations by August 27, 1996. The rate for these rooms is $99.00 for a single ($119.00 for a double). Please mention that you will be attending the UL meeting when confirming your reservations.

Please complete the attached attendance form and return it no later than August 27, 1996.

UNDERWRITERS LABORATORIES INC.

Raymond M. Suga (mc)

RAYMOND M. SUGA (Ext. 22593)
Senior Engineering Associate
Standards Department
(Fax: 516-271-6221)

REVIEWED BY:

George J. Fechtmann (mc)

GEORGE J. FECHTMANN (Ext. 22858)
Associate Managing Engineer
Engineering Services 216P
(Fax: 516-547-8217)

SR: PKW

0746IAC.R02;WH;mc

Subject 746 (94)

August 13, 1996

ATTENDANCE FORM

SEPTEMBER 10, 1996 IAC/IAG MEETING IN
RTP, NC
PLASTICS, UL 746, 94

(Please Print or Type)

NAME: _____
(As you would like it to appear on your name tag/table tent)

COMPANY: _____

☐ I will be attending the meeting.

☐ I will not be attending the meeting.

If you want to bring another person or send a substitute who can contribute substantially to the discussion, you are requested to contact us for permission to do so. Such a request should be made as early as possible prior to the meeting.

Please send the completed form no later than August 27, 1996 to:

Underwriters Laboratories Inc.
1285 Walt Whitman Road
Melville, NY 11747-3081

Attention: Raymond M. Suga (Ext. 22593)
Senior Engineering Associate
Standards Department
(516) 271-6200
(516) 271-6221 (Fax)

PROPOSED REQUIREMENTS ARE OF A TENTATIVE AND EARLY NATURE AND ARE FOR REVIEW AND COMMENT ONLY. CURRENT REQUIREMENTS ARE TO BE USED TO JUDGE A PRODUCT UNTIL THESE REQUIREMENTS ARE PUBLISHED IN FINAL FORM.

AGENDA

MEETING OF THE IAC OF UL FOR BASIC PLASTIC MATERIALS AND IAG FOR POLYMERIC INSULATING MATERIALS

For your convenience in review, proposed additions to existing requirements are shown underlined and proposed deletions are shown ~~lined out~~. Proposed new requirements are identified by (NEW). In the case of extensively revised paragraphs, the original text is identified by (CURRENT) and is ~~lined out~~, followed by the proposed text identified by (PROPOSED). A paragraph that is proposed to be deleted is identified by (DELETED) and is shown ~~lined out~~.

1. PLASTICS STEERING COMMITTEE UPDATE

DISCUSSION

UL will present an update on the research projects being conducted under this program. The following is a list of the specific projects that are currently active:

1. HAI - Phase II
2. Update IR Spectra for Industrial Laminates
3. Performance at Temperature
4. Comparison of CTI Methods
5. LTHA - Effect of Air Changes
6. Automated UL 94 Test
7. Relational Database for Plastics Data
8. Rigorous Protocol for Establishing New Generic RTI(s)
9. UL 746C Based International Guidance Document
10. 1996 UL Representation on the IEC TC15, TC61, TC89 and ISO TC61 Committees
11. Preliminary Evaluation of the Rapid RTI Methodology Proposal and the Feasibility of General Rapid Analytical Methods for RTI Determination

2. ASTM/IEC/ISO ACTIVITIES UPDATE

DISCUSSION

UL staff will present a summary of their participation on various plastics related working groups and technical committees.

3. CONSIDERATION OF INCREASED GENERIC RTI FOR PPHOX AND POLYETHERIMIDE

DISCUSSION

UL has established a research project to develop guidelines for assigning upgraded (higher temperature generic RTIs) for plastics. Since UL has received requests to raise the generic thermal index for PPHOX and polyetherimide, UL has utilized guidelines developed under the research project to determine what suitable generic RTIs should be. UL will discuss the guidelines developed as they relate to specifically raising the generic RTI for these two materials and also determine whether they are appropriate, in a broader context, for use in evaluating requests to raise the generic RTI for other materials.

A Status Report is attached as Appendix B.

4. GENERIC RTI FOR TWO-PART EPOXY (EP) MATERIALS

DISCUSSION

Table 6.1 of UL 746B tabulates the Relative Thermal Indices of various materials based on past performance, field service history, and chemical structure. The RTIs for epoxy materials vary according to the exact type of epoxy in question. Molding resin, powder or coating material, and casting and potting resin have RTIs of 130°C, 105°C, and 90°C, respectively. This differentiation is made through footnotes b, c, and d in the Table. Footnote c stipulates that the 130°C rating is only appropriate for those compounds molded by high-temperature and high-pressure processes.

Occasionally, UL receives a submittal of a two-part epoxy material that can either be mixed and used directly (usually as a potting compound) or mixed then molded in a subsequent manufacturing step. UL has maintained that, in such cases, the appropriate generic RTI published for this material should be 90°C and not 130°C that would be appropriate for "molding resins." A File Review may be needed to make sure that all two-part liquid epoxy systems have been assigned the appropriate 90°C generic RTI.

5. CLARIFICATION OF GENERIC RTI FOR POLYPROPYLENE (PP)

DISCUSSION

It has been brought to our attention that, in practice, UL has assigned a generic Relative Thermal Index of 65°C to polypropylene copolymers provided polypropylene is the dominant constituent; however, UL 746B does not reflect this practice.

PROPOSAL

Accordingly, UL is proposing to revise Table 6.1 of UL 746B (and similarly in Table 35.1 in UL 746C) by adding an explanatory footnote. See Appendix C for the proposed text of the UL 746B revision.

RATIONALE

To revise the standard to reflect established UL investigation practices.

IMPACT

This proposal is considered editorial and would not have a significant effect upon manufacturers.

6. UL 746B, TABLE 19.1 - DELETION OF DIELECTRIC STRENGTH TESTING OF "WET" SAMPLES

DISCUSSION

UL is considering revising Table 19.1 of UL 746B to delete the testing of humidity-conditioned samples from the Dielectric Strength Test following long-term heat aging.

RATIONALE

Experience has shown that the Dielectric Strength testing of humidity exposed specimens has rarely provided critical data additional to the corresponding data for standard-laboratory-condition-tested specimens; yet, such testing imposes a significant hardship on test resources. UL considers such testing unnecessary and is proposing to delete it from the existing requirements.

PROPOSAL

Accordingly, Table 19.1 of UL 746B would be revised to delete Item 2 under "Dielectric Strength". A manufacturer could elect to conduct such tests as a "secondary property" but it would no longer be mandatory. See Appendix D.

IMPACT

No impact will result from the change since humidity conditioning after aging has no discernible effect.

7. UL 746B, TABLE 18.1 - AD HOC COMMITTEE UPDATE

DISCUSSION

UL is proposing to revise Table 18.1 to be more precise in defining the Long Term Heat Aging (LTHA) testing that is required for material variations. An Ad Hoc Committee was formed for this purpose and has met extensively to study this issue.

PROPOSAL

See Appendix E for the proposed text.

RATIONALE

Input from industry at past meetings indicated that clarifications were needed so that manufacturers could more accurately determine what test levels would apply when they make small changes to the formulation of existing materials.

IMPACT

While the revamped table is intended to be more specific, it does not represent a change in requirements so this proposal will not have a significant impact on manufacturers.

8. GLOBAL PRODUCTS CLASSIFICATION

DISCUSSION

UL has received a request from industry to develop a new standard to cover Global Products. In the Subjects 746 (94) Bulletin dated October 25, 1995, UL adopted changes that provide more flexibility in accepting alternate manufacturing locations without testing. The merit of including these types of guidelines in a published standard will be discussed.

See Appendix F for a copy of the letter we received that requested consideration of this item.

9. DOWNGRADING GUIDELINES

DISCUSSION

UL has, on occasion, been requested to "downgrade" the rating of a Recognized Component Plastic material. This downgrading could take a number of forms such as:

1. Lowering a material's flammability rating,
2. Decreasing a PLC value (performance indexing characteristics),
3. Increasing the minimum thickness of a material associated with an existing rating (from the present minimum thickness), or
4. Deleting a color(s).

An Ad Hoc Committee was formed to develop guidelines establishing the permissible circumstances when a downgrading could be made.

The results of the committee's work are shown in Appendix G.

10. POLYCARBONATE FILE REVIEW UPDATE

DISCUSSION

UL is opening projects and testing unfilled polycarbonate (PC) materials for compliance with the requirements that become effective October 1, 1997. A status report of these activities will be presented.

11. REQUEST TO REVISE UL 94-5V TEST

DISCUSSION

UL has received a request to consider changing current UL 94 requirements by no longer requiring that 94-5V rated materials also comply with the 94V test as is currently required in 9.1.1.1 of UL 94. Another manufacturer has asked that UL modify the 94-5V Follow-Up Service test requirements to include the testing of plaques.

See Appendix H for a copy of the letter that generated the first part of this discussion item.

12. CHARPY IMPACT TEST

DISCUSSION

At the IAC meeting held in September, 1995, UL indicated that it was appropriate to include the Charpy Impact test as an alternate to the Impact Tests currently referenced. UL has now developed tentative proposed revisions for UL 746A, UL 746B, and 746C.

RATIONALE

Specimens for the Charpy Test are 4 mm by 10 mm and are usually cut from the Universal Test Specimen. Also, the ISO527-2 Tensile Strength Method now has Type 1A and 1B specimens. Type 1A is the Universal Test Specimen and is the preferred specimen for the ISO Tensile, Charpy, and Flex Test Methods; therefore, UL considers it appropriate to include the Charpy test and to provide the 4 mm by 10 mm specimen as an alternate to the 3.2 mm by 13 mm ASTM specimen.

PROPOSAL

See Appendix I.

IMPACT

Since this is a testing option, the addition of the Charpy test will not require a review of presently Recognized materials.

13. UL 746A - BALL PRESSURE TEST IN SECTION 28

DISCUSSION

The Ball Pressure Test currently described in Section 28 of UL 746A is experiencing widespread international use. The test method is specified in IEC 695-10-2 and material performance determinations (made using this test) are included in end-product standards such as IEC 335-1 for general electrotechnical appliances. Normally, a proof test is conducted on finished parts, where minimum performance is checked against a prescribed maximum temperature (for example, 75°C or 125°C as specified in IEC 335-1). UL is considering rewording the present UL 746A Ball Pressure Test to directly reference IEC 695-10-2 rather than display the full test method description, as is currently done. UL also considers it appropriate to move the present requirement, which is essentially an end-product test, to UL 746C.

To reduce the amount of end-product testing, UL is additionally considering placing a version of the Ball Pressure Test in UL 746A (after the existing requirements which reflect an end-product test are moved to UL 746C) that would serve as a "pre-selection" test. By subjecting test specimens through a range of test temperatures, the maximum temperature could be determined at which the material will achieve acceptable results during the Ball Pressure Test. The resulting performance levels would be published along with the other Performance Indexing properties. As with the end-product test being moved to UL 746C, a direct reference to IEC 695-10-2 will replace a full explanation of the test method for the Ball Pressure test. Guidelines for sample selection and trial temperatures appropriate for the pre-selection test would be included in UL 746A (but not in 746C). A discussion of the concepts will take place at the meeting.

14. UL 746C, TABLE 8.1 - HEAT DEFLECTION TEMPERATURE

DISCUSSION

UL proposed in the Subjects 746 (94) Bulletin dated October 25, 1995, to add "or maximum temperature achieved" in Table 8.1 with regard to the Recommended Levels for the Heat Deflection Temperature Test Under Load. UL wishes to discuss further the interpretation of "maximum limits".

IMPACT

A File Review of end-product devices and equipment may be required to verify that the HDT of the materials used in the end products comply with the revised requirements.

15. UL 746C, FIGURE 5.1 - PROPOSED REVISION

DISCUSSION

UL has received a request from the technical staff of the U.S. Consumer Product Safety Commission to reexamine the issue of the use of 94HB enclosure materials for portable appliances that are not attended, intermittent duty household-use products. See Appendix J for a copy of the letter that initiated this discussion item.

IMPACT

The considered upgrade in requirements would result in a File Review of end-product devices and equipment to verify that 94V-2 or better materials are used for polymeric enclosures of portable appliances that are not attended, intermittent duty household use. In accordance with footnotes e and f of Figure 5.1 in UL 746C, materials that comply with either the 12 mm or 3/4 inch flammability tests described in Sections 17 and 18 may also be acceptable in these enclosure applications.

16. REFERENCE TO LAUNDRY AND DISHWASHER REQUIREMENTS ON THE QMFZ2 GUIDE INFORMATION PAGE

DISCUSSION

There are some special end-product testing requirements for plastic materials used in laundry equipment and dishwashers which are covered under UL 560 and UL 749, respectively. Some end-product manufacturers of these products have suggested that the Component Plastics (QMFZ2) guide information page be modified to include a footnote that would identify plastic materials that have been subjected to the supplemental test program and accepted for such use. Similarly, a paragraph would be added to UL 746C calling attention to this program. UL will discuss the proposal at the meeting.

17. PROPRIETARY PLASTICS UPDATE

DISCUSSION

UL is proceeding to develop a revised Guide information page for Proprietary Plastics (QMTR2). The present marking requirement (Recognized Component Symbol and the words "Proprietary Plastic") will be deleted. The required marking will now consist of the company name (or identifying symbol) and material designation. This will align the marking requirements with category QMFZ2 (Component Plastics).

Furthermore, the Guide information will include a statement that "verification of Recognition can be determined via the UL computer database for the category." The Recognized material designation, along with the property characteristics of the proprietary plastic, will be in a non-published, hidden format in the internal UL database. Only the material manufacturer's name and address will be published in the Plastics Recognized Component Directory.

UL Follow-Up Service Representatives can verify the material's Recognition status under QMTR2 during an end-product inspection by checking the Plastics Recognized Component Directory for the material manufacturer's name and contacting the nearest UL office for specific material information on the UL database.

18. REVISION OF QMFZ2 GREY PAGES

DISCUSSION

UL is revising the grey and white Appendix Pages of the manufacturer's Follow-Up Service Procedure for Component Plastics. The revisions concern the provisions for molding samples outside of the manufacturer's facility. Additional revisions concern inspection-visit scheduling and the type of samples to be selected by our Field Representative for the purpose of Follow-Up Service Testing. These revisions will be briefly discussed.

19. CLIENT INTERACTIVE PROGRAM

DISCUSSION

Investigations of products by UL usually involve the testing of samples. While UL maintains extensive facilities for testing purposes, it is also possible to utilize manufacturer's test facilities under UL's Client Interactive Program (CIP). The CIP has been established to assist clients to achieve certification of products in less time, and at less cost, thereby avoiding unnecessary duplication of facilities and effort. The Client Interactive Program (CIP) encompasses the Witnessed Test Data Program (WTDP) and the Client Test Data Program (CTDP).

Under the WTDP, tests are conducted at client test facilities under the supervision of UL personnel. The samples tested, equipment used, methods employed, and results obtained are documented as part of a data sheet package.

Under the CTDP, tests are conducted at client facilities by client personnel. CTDP test results utilized by UL are subject to UL review and audit and a suitable laboratory quality program is required.

Both programs require that the client have the physical resources, equipment, and qualified personnel needed to conduct the specific testing.

These programs will be briefly discussed at the meeting.

20. UL 94 - EDITORIAL CORRECTIONS

DISCUSSION

UL staff has identified various editorial revisions for UL 94 that are desirable.

RATIONALE

These editorial revisions would serve to harmonize the UL standard with outside documents.

PROPOSAL

See Appendix K.

IMPACT

Being editorial, these revisions should not affect manufacturers.

21. UL 94 FLAME RATING DESIGNATION(S)

DISCUSSION

UL is proposing the elimination of the "94" prefix of the existing flammability ratings. The flame designations 94HB, 94V-0, 94V-1, 94V-2, 94-5VA and 94-5VB would be replaced by the new designations HB, V-0, V-1, V-2, 5VA, and 5VB, respectively.

RATIONALE

The flame classifications HB, V-0, V-1, V-2, 5VA, and 5VB have become familiar global terms. The international standards ISO1210, ISO10351, IEC695-11-10, IEC695-11-20, IEC707, ASTM D635, ASTM D3801, ASTM D5048, and CSA C22.2 No. 0.17 either have this classification system or are in the process of adopting it. The international CAMPUS data base already incorporates this terminology; consequently, there is no need to maintain the "94" in the designations.

PROPOSAL

Specific revisions will be developed at such time as the concept is accepted. The change in flammability designations will necessitate the revision of UL 94, the UL 746 series, UL 1694, and various other standards. For consistency, UL would also revise the remaining UL 94 flammability designations, such as 94VTM-0, 94VTM-1, 94VTM-2, 94HFB, 94HF-1, and 94HF-2.

IMPACT

No File Review will be necessary and the specific Recognitions within a client's File will be changed when other revisions are processed.

22. PLC'S FOR HOT WIRE IGNITION TEST

DISCUSSION

A manufacturer has requested discussion of the Hot Wire Ignition Test in UL 746A. The PLC (Performance Level Category) is based on the mean time to ignite the sample; however, it has been UL's practice to discontinue the test, and record the time of occurrence, when the sample melts to the extent that the wire wraps are no longer in contact with the sample. It has been suggested that the PLCs be assigned based on mean ignition times and that materials that don't ignite, due to melting, be treated differently in the published ratings. This will be explored at the meeting.

See Appendix L for a copy of the letter that generated this discussion item.

IMPACT

A File Review of published HWI PLCs may be necessary to revise these ratings.

23. METALLIZED PARTS AD HOC

There is a concern regarding the interpretation of test results, namely if a thin layer of coating removed during the Tape Adhesion Test represents a true bond failure of the coating or if it only represents removal of "dust" remaining from the coating process. Discussion of such test results among UL personnel has led to other concerns regarding these products, such as sample preparation, material performance in the field, and the like.

As such, it is UL's intention to form an Ad-Hoc Committee to review the test procedures, interpretation of test results, Follow-Up Program, coating material performance, industry trends, industry concerns, and so forth, associated with the categories of Metallized Parts (QMRX2) and Supplier Components for Use in the Fabrication of Metallized Parts (QMSS2). Anyone interested in participating in this committee should contact the engineer from the office they normally deal with. It is expected that this committee will be formed by the end of the year and that a formal agenda will be presented at that time.

PROPOSED REQUIREMENTS ARE OF A TENTATIVE AND EARLY NATURE AND ARE FOR REVIEW AND COMMENT ONLY. CURRENT REQUIREMENTS ARE TO BE USED TO JUDGE A PRODUCT UNTIL THESE REQUIREMENTS ARE PUBLISHED IN FINAL FORM.

APPENDIX B

MEETING OF THE IAC OF UL FOR BASIC PLASTIC MATERIALS AND THE IAG OF UL FOR POLYMERIC INSULATING MATERIALS

ITEM 3. CONSIDERATION OF INCREASED GENERIC RTI FOR PPHOX AND POLYETHERIMIDE

STATUS REPORT ON A RESEARCH PROJECT TO ESTABLISH GUIDELINES FOR ASSIGNING NEW OR UPGRADED GENERIC RTI(S).

UL has established a research project to develop guidelines for assigning upgraded or new (upgraded from 50 °C) generic RTI(s). It is generally acknowledged that at some point, enough experience is gained with a defined generic class to warrant an upgrade to some new level, where essentially all materials in the class would be assigned RTI(s) exceeding the upgraded value for any property or thickness if subjected to rigorous UL746B programs. UL is attempting to formalized this approach into a protocol of guidelines, where RTI data developed on a generic class might be analyzed to arrive at an upgraded generic RTI for the class.

The initial proposal is that, at some point enough data might be developed on a generic class to reliably determine the distribution of RTI(s), and then an upgraded generic value might be assigned as two standard deviations below the mean of RTI(s) of the class. A number of issues might require resolution based on further analysis of existing RTI data, associated current generic RTI(s) that are considered appropriate, and field experience, and the like. For example, what constitutes sufficient data to reliably define the distribution of RTI(s)? Also, some account must be taken of the tendency of RTI data to be more available for materials specifically engineered for superior RTI performance - i.e., clients are more likely to submit better performing materials for RTI evaluations.

It has recently been proposed to upgrade the generic (RTI) for PPHOX materials form 50 °C to 65 °C, and RTI data for these materials has been selected for the initial study using the UL data base of RTI(s). At least 224 cases, where all three RTI(s) exceeded 50°C, were considered, yielding a mean of 92.9 °C with standard deviation of 13.0 °C and a distribution as follows:

RTI	#	RTI	#	RTI	#
65	11	80	49	95	1
70	0	85	25	100	0
75	9	90	17	105	112

The apparent new generic RTI computes to 92.9 - (2 x 13.0) = 66.9 °C, suggesting that the proposed 65°C might be appropriate; however, it should be noted that the distribution is far from "normal" and that 11 cases were precisely at 65°C, though most of these were probably the result of limited programs or special other problems. Data on additional classes are under consideration.

GE Plastics

Americas Technology Division
General Electric Company
Agency Services
One Noryl Avenue, Selkirk, NY 12158

March 18, 1996

Mr. Raffic Ali
Engineering Manager/Chairman IAC/IAG UL94/746
Underwriters Laboratories Inc.
12 Laboratory Drive
P.O. Box 13995
Research Triangle Park, NC 27709-3995

Attention: Mr. Raffic Ali

Subject: Proposed Inclusion of Polyetherimide Material on Table 6.1 of UL746B

Dear Mr. Ali,

GE Plastics would like to request that polyetherimide resin be considered for addition to Table 6.1 of UL746B Polymeric Materials-Long Term Property Evaluations at the fall IAC/IAG meeting. We recommend that a minimum generic thermal indices of 105°C be assigned to this polymer.

Our proposal is based on considerable technical data generated by Underwriters Laboratories Inc. with our cooperation and through fifteen plus years of end-use field experience in the marketplace. The weight of this evidence leads us to believe that the current 50°C generic rating is unrealistic, trade restrictive, and in no way compromises the safe application of polyetherimide material in electrical, electronic, or other UL recognized components or listed products.

To assist Underwriters Laboratories Inc. and the industry advisory group, we have compiled a comprehensive list of all GE Plastics polyetherimide materials (homopolymers only) made globally. Each product listed has RTI values well above current generic 50°C and conservatively beyond the proposed 105°C.

Should you have any questions regarding this information or need additional technical input, please let us know. Our Agency Services and ULTEM® Technology Department are at your full disposal to answer any questions not of a proprietary nature.

We look forward to receiving your response as soon as possible.

Yours truly,

Kilburn (Kibby) L. White, Jr.
Team Leader
Agency Services
Product Recognition Programs

/lm
cc: P. Brown-Pittsfield
G. Fecthmann-UL Melville
J. Flock-Mt. Vernon
J. Heuschen-Pittsfield
T. Koppers-BoZ
D. Nazareth-Mt. Vernon
T. Toki-Japan

LONG-TERM HEAT AGING PERFORMANCE OF
POLYETHERIMIDE HOMOPOLYMER
Page 1 of 3

NEAT RESINS						
				RTI °C		
Material	Color	Thickness (mm)	UL94 Flame Class	Elec	Mechanical	
					with impact	w/o impact
1000 LTX900A 1000F 1000R 1100 1100F	All	0.41	94V-0	50	50	50
		0.71	94V-0	170	170	170
		1.60	94 V-0	170	170	170
		1.90	94V-0 94 5VA	170	170	170
		3.17	94 V-0 94 5VA	170	170	170
*1010 LTX900B 1010R 1010F 1110F	NC Black All	0.71	94 V-0	170	170	170
		1.50	94 V-0	170	170	170
		3.00	94 V-0 94 5VA	170	170	170
1040	All	0.36	94 V-0	160	50	160
		0.80	94 V-0	160	50	160
		1.50	94 V-0	160	50	160
		3.20	94 V-0	160	50	160
CRS5001	All	1.59	94 V-0	160	160	160
		3.15	94 V-0	160	160	160
CS5011	All	1.59	94 V-0	160	155	160
		3.15	94 V-0	160	155	160

GLASS REINFORCED RESINS						
				RTI °C		
Material	Color	Thickness (mm)	UL94 Flame Class	Elec	Mechanical	
					with impact	w/o impact
2300 2300R 2310 2310R	All	0.25	94 V-0	50	50	50
		1.60	94 V-0	180	170	180
		3.20	94 V-0	180	170	180
2100, 2100R 2200, 2200R 2210# 2210R 2110R 2110	All	0.41	94 V-0	50	50	50
		1.60	94 V-0	170	170	170
		3.20	94 V-0	170	170	170
*2212 *2212R	All	0.41	94 V-0	50	50	50
		1.60	94 V-0	170	170	170
		3.20	94 V-0	170	170	170
2312 2312R	All	0.81	94 V-0	50	50	50
		1.60	94 V-0	170	170	170
		3.20	94 V-0	170	170	170
MD119	All	0.44	94 V-0	50	50	50
		1.60	94 V-0	170	170	170
		3.20	94 V-0	170	170	170
2400 2400R	All	0.25	94 V-0	50	50	50
		1.57	94 V-0	170	170	170
		3.15	94 V-0	170	170	170
2410 2410R	All	0.25	94 V-0	50	50	50
		1.57	94 V-0 94 5VA	170	170	170
		3.15	94 V-0 94 5VA	170	170	170

MINERAL FILLED RESINS						
				RTI °C		
Material	Color	Thickness (mm)	UL94 Flame Class	Elec	Mechanical	
					with impact	w/o impact
3452	NC Black	0.77	94 V-0	50	50	50
		1.55	94 V-0	180	180	180
		3.10	94 V-0 94 5VA	180	180	180

FLUORO FILLED RESINS						
				RTI °C		
Material	Color	Thickness (mm)	UL94 Flame Class	Elec	Mechanical	
					with impact	w/o impact
4001	Nat. Black	0.38	94 V-0	50	50	50
		1.63	94 V-0	170	170	170
		3.20	94 V-0	170	170	170
	All	1.50	94 5VA	50	50	50

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APPENDIX C

MEETING OF THE IAC OF UL FOR BASIC PLASTIC MATERIALS AND THE IAG OF UL FOR POLYMERIC INSULATING MATERIALS

ITEM 5. CLARIFICATION OF GENERIC RTI FOR POLYPROPYLENE (PP)

PROPOSED REQUIREMENTS FOR UL 746B

TABLE 6.1
RELATIVE THERMAL INDICES BASED UPON PAST FIELD-TEST PERFORMANCE AND CHEMICAL STRUCTURE[a]

Material	ISO Designation		Generic Thermal Index, °C
Polyamide (Type 6, 11, 12, 66, 610, or 612 nylon)[b]	(PA)		65
Polycarbonate[b]	(PC)		75
Polyethylene terephthalate — molding resin[b]	(PET)		75
film (0.010 inch, 0.25 mm)	(PET)		105
Polybutylene (polytetramethylene) terephthalate[b]	(PBT)		75
Polypropylene[b,g]	(PP)		65
Polyphenylene Sulfide[b]	(PPS)		105
Molded phenolic[c]	(PF)		150
Molded melamine[c,d] — specific gravity < 1.55			130
specific gravity ≥ 1.55			150
Molded melamine/phenolic[c,d] — specific gravity < 1.55			130
specific gravity ≥ 1.55			150
Polytetrafluoroethylene	(PTFE)		180
Polychlorotrifluoroethylene	(PCTFE)		150
Fluorinated ethylene propylene	(FEP)		150
Urea Formaldehyde[c]	(UF)		100
Acrylonitrile — butadiene — styrene[b]	(ABS)		60
Silicone — molding resin[c,d]			150
Silicone rubber — molding resin	(SIR)		150
room-temperature vulcanizing or heat-cured paste	(RTV)		105
Epoxy — molding resin[c,d]			130
powder coating materials			105
casting or potting resin[b]	(EP)		90
Molded diallyl phthalate[c,d]			130
Molded unsaturated polyester[c,d] alkyd (AMC), bulk (BMC), dough (DMC), sheet (SMC), thick (TMC), and pultrusion molding compounds	(UP)	(electrical)	105[e]
		(mechanical)	130
Liquid crystalline thermotropic aromatic polyester[f]	(LCP)		130
Ligno-cellulose laminate			60
Vulcanized fiber			90
Cold-molded phenolic, melamine or melamine-phenolic compounds[d] — specific gravity < 1.55			130
specific gravity ≥ 1.55			150
Cold-molded inorganic (hydraulic-cement, etc.) compounds			200
Integrated mica, resin-bonded - epoxy, alkyd or polyester binder			130
phenolic binder			150
silicone binder			200

(Continued)

TABLE 6.1 (Cont'd)

[a] Generic thermal index is for homopolymer resins only unless a specific copolymer or blend is indicated. In the case of alloys, the lowest generic index of any component shall be assigned to the composite.

[b] Includes glass-fiber reinforcement and/or talc, asbestos, mineral, calcium carbonate, and other inorganic fillers.

[c] Includes only compounds molded by high-temperature and high-pressure processes such as injection, compression, pultrusion, and transfer molding and match-metal die molding; excludes compounds molded by open-mold or low-pressure molding processes such as hand lay-up spray-up, contact bag, filament winding, rotational molding, and powder coating (fluidized bed, electrostatic spray, hot dip, flow coating).

[d] Includes materials having filler systems of fibrous (other than synthetic organic) types but excludes fiber reinforcement systems using resins that are applied in liquid form. Synthetic organic fillers are to be considered acceptable at temperatures not greater than 105°C.

[e] Except 130°C generic thermal index if the material retains at least 50% of its unaged dielectric strength after a 504-hour exposure at 180°C in an air circulating oven. Specimens are to be tested in a dry, as molded, condition. Specimens that are removed from the oven are to be cooled over desiccant for at least 2 hours prior to testing.

[f] Includes only wholly aromatic liquid crystalline thermotropic polyesters; wholly aromatic polyester/amides and wholly aromatic polyester/ethers; excluding amorphous, lyotropic and liquid crystalline aliphatic-aromatic polyesters which are aliphatic in the backbone chain or main chain, and substituted aromatic polyesters (except for methyl or aromatic).

[g] Includes polypropylene copolymers where the dominant constituent is polypropylene.

Table 6.1 revised (Date of publication)

PROPOSED REQUIREMENTS ARE OF A TENTATIVE AND EARLY NATURE AND ARE FOR REVIEW AND COMMENT ONLY. CURRENT REQUIREMENTS ARE TO BE USED TO JUDGE A PRODUCT UNTIL THESE REQUIREMENTS ARE PUBLISHED IN FINAL FORM.

APPENDIX D

MEETING OF THE IAC OF UL FOR BASIC PLASTIC MATERIALS AND THE IAG OF UL FOR POLYMERIC INSULATING MATERIALS

ITEM 6. UL 746B, TABLE 19.1 - DELETION OF DIELECTRIC STRENGTH TESTING OF "WET " SAMPLES

TEXT OF PROPOSAL FOR UL 746B

TABLE 19.1
CONDITIONING BEFORE PROPERTY MEASUREMENT
(Example)

Property		Conditioning
Tensile (flexural) strength Tensile (IZOD) Impact		Min. 40 h exposure to 50 ±5 percent relative humidity at 23.0 ±3.0°C (73.4 ±5.4°F)
Dielectric Strength[a]	(1)	Min. 40 h exposure to 50 ±5 percent relative humidity at 23.0 ±3.0°C (73.4 ±5.4°F)
	~~(2)~~	~~Min. 96 h exposure to 90 ±5 percent relative humidity at 35.0 ±3.0°C (95.0 ±5.4°F)~~
Flammability (Material Rated 94V-2 or Better)	(1)	Cooled in desiccators a minimum of 4 hours after oven exposure

[a] The surrounding medium for the dielectric strength test should be air, using shrouded electrodes.

(TM-601)

Table 19.1 revised (Date of publication)

TABLE 19.3
NUMBER OF SPECIMENS REQUIRED FOR THERMAL AGING (Example)

Test Material	Test: Property	Test: Method	Thickness mm	Specimens: Number per Set	Specimens: Number for Initial Tests	Specimens: Number for All Temperatures	Specimens: Number for UL Referee Test[b]	Specimens: Total
Candidate (proposed) strength	Tensile (flexural)	UL 746A	3.2	5	10	220	60	290
			1.6	5	10	110	—	120
			0.8	5	10	110	—	120
	Tensile (Izod) impact	UL746A	3.2	5	10	220	60	290
			1.6	5	10	110	—	120
			0.8	5	10	110	—	120
	Dielectric strength	UL746A	0.8	~~10~~ 5	~~20~~ 10	~~440~~ 220	—	~~460~~ 230
	Flammability (Materials Rated 94V-2 or better)	UL94	MT[a]	20	20	100	20	140
Control (known)	Tensile (flexural) strength	UL746A	3.2	5	10	220	60	290
	Tensile (Izod) impact	UL746A	3.2	5	10	220	60	290
	Dielectric strength	UL746A	0.8	~~10~~ 5	~~20~~ 10	~~440~~ 220	—	~~460~~ 230

[a] MT represents the minimum thickness evaluated, usually 0.8mm.

[b] These specimens are only required if a UL referee test is considered necessary.

(TM-603)

Table 19.3 revised (date of publication)

TABLE 19.6
NUMBER OF SPECIMENS REQUIRED FOR THERMAL AGING (FILM ≤ 0.010 INCH)

Test Material	Test: Property	Test: Method	Thickness mm	Specimens: Number per Set	Specimens: Number for Initial Tests	Specimens: Number for All Temperatures	Specimens: Number for UL Referee Test[b]	Specimens: Total
Candidate (proposed)	Tensile strength	ASTM D-882	0.127	5	10	160	60	230
			MT[a]	5	10	80	–	90
	Dielectric strength	ASTM D-1830	MT[a]	~~10~~ 5	~~20~~ 10	~~32~~ 160	–	~~340~~ 170
	Flammability (Materials Rated 94VTM-2 or 94V-2 or better)	UL94	MT[a]	20	20	100	20	140
Control (known)	Tensile strength	ASTM D-882	0.127	5	10	160	60	230
	Dielectric strength	ASTM D-1830	MT[a]	5	10	160	–	170

[a] MT represents the minimum thickness evaluated, usually 0.8mm.

[b] These specimens are only required if a UL referee test is considered necessary.

Table 19.6 revised (date of publication)

PROPOSED REQUIREMENTS ARE OF A TENTATIVE AND EARLY NATURE AND ARE FOR REVIEW AND COMMENT ONLY. CURRENT REQUIREMENTS ARE TO BE USED TO JUDGE A PRODUCT UNTIL THESE REQUIREMENTS ARE PUBLISHED IN FINAL FORM.

APPENDIX E

MEETING OF THE IAC OF UL FOR BASIC PLASTIC MATERIALS AND THE IAG OF UL FOR POLYMERIC INSULATING MATERIALS

ITEM 7. UL 746B, TABLE 18.1 - AD HOC COMMITTEE UPDATE

PROPOSED REQUIREMENTS FOR UL746B

TABLE 18.1
TEST CONSIDERATIONS BASED UPON VARIATION IN MATERIAL COMPOSITION

Compound Variation	Addition or Change in Additive Concentration of the Weight that is Used in the Basic Concentration[a]	Remarks
1. Molecular Weight	Not Applicable	One or two temperature thermal aging (see paragraphs 18.8 and 18.9) may be required if molecular weight variations may influence the degree of branching or crosslinking of the polymer structure.
2. Lubricants, Release Agent, Antistatic Agents, Acid Scavengers, (of the type not considered to affect aging), Halogen Scavengers, Fillers, Reinforcements and Inorganic Pigments	(a) ≤ 5 percent (b) > 5 and ≤ 20 percent (c) > 20 percent	(a) No additional thermal aging tests are required. (b) One or two temperature thermal aging may be required (see paragraphs 18.8 or 18.9) (c) Full thermal aging may be required.
3. Nucleating Agents, UV Stabilizer, (of the type not considered to affect aging), Flame Retardants (of the same type used in the basic polymer), Dyes and Organic Pigments (including carbon black)	(a) ≤ 0.3 percent (b) > 0.3 percent	(a) No additional thermal aging tests are required. (b) One or two temperature thermal aging tests may be required (see paragraphs 18.8 or 18.9)
4. Addition of/or Different Flame Retardant, Heat Stabilizer, Impact Modifiers, Plasticizers, Antioxidants, Inert Gas or Chemical Blowing Agents (resulting in more than 5 percent reduction in the specific gravity of the unfoamed polymer), Metallic Stabilizers, Monomer ratios and all other additives	Any Concentration	Full thermal aging may be required

[a] Pigment variation is based on concentration by weight of the total material composition.

TABLE 18.1
TEST CONSIDERATIONS BASED UPON VARIATION IN MATERIAL COMPOSITION

Ingredient Variant	Addition of Ingredient	Change in Existing Ingredient Level	Deletion of Existing Ingredient
Reinforcements and Fillers, Lubricants, Release Agents, Plasticizers [i], Processing Aids, Antistats, Acid Scavengers, Halogen Scavengers, Low Wear Additives, Conductive Materials (physical properties only)	≤ 5 % Absolute	≤ 5 % Absolute	≤ 5 % Absolute
Nucleating Agents and Corrosion Inhibitors	≤ 1 % Absolute	≤ 1 % Absolute	≤ 1 % Absolute
UV Stabilizers	≤ 0.3 % Absolute	≤ 1 % Absolute	No Limit for Deletion
Flame Retardants, Impact Modifiers, Coupling Agents, and Polymer Blends	Testing Required in All Cases	≤ 30 % Normalized	Testing Required in All Cases
Inorganic Pigments	≤ 5 % Absolute	≤ 30 % Normalized	No Limit for Deletion
Organic Pigments (including CB)	≤ 0.5 % Absolute	≤ 30 % Normalized	No Limit for Deletion
CoMonomers	≤ 1 % Absolute	≤ 30 % Normalized	≤ 1 % Absolute
Heat Stabilizers, AntiOxidants	No Limit for Additions	No Limit for Additions	Testing Required in All Cases
Blowing Agents	Results in ≤ 5 % Decrease in Specific Gravity	≤ 30 % Normalized	No Limit for Deletion

18.4 ~~The new polymer is to be related to the basic polymer in the sense that it is made by the same manufacturer and employs the same resin, flame retardant, and heat stabilizer (if any). It is to be made under the same synthesis conditions and is to consist essentially of the same proportions of basic ingredients.~~

Paragraph 18.4 deleted (date of publication)

(NEW)
18.4A In Table 18.1: Absolute percentages of additions, changes and deletions are computed as the final weight minus the initial weight of the additive, divided by the initial total weight of the material (multiplied by 100). For example, if 12 grams of material initially contains 3.6 grams of glass reinforcer and this is increased to 4.8 grams by the addition of 1.2 grams of glass reinforcer, the change of this component is [(4.8 - 3.6) / 12] x 100 = +10% Absolute.

Paragraph 18.4A added (date of publication)

(NEW)
18.4B In Table 18.1, Normalized percentages of additions, changes and deletions are computed as the final weight minus the initial weight of the additive, divided by the initial weight of the additive (multiplied by 100). If the additive is a component of an additive system, then it is considered as a separate additive for purposes of computing the Normalized percentages. For example, if 12 grams of material initially contains a flame retardent system consisting of 0.6 grams of inorganic component with 0.06 grams of organic component, and the organic component is increased by the addition of 0.012 grams to 0.072 grams, the change of this component is [(0.072 - 0.060) / 0.060] x 100 = 20% Normalized.

Paragraph 18.4B added (date of publication)

(NEW)
18.4C In cases where the limits in Table 18.1 are exceeded, testing will include one or two temperature aging (UL 746B) using the unaltered basic material as the control reference. Both the impact and non-impact mechanical properties tested in the nominal 3 mm thickness can be considered representative of other properties and thicknesses, however, if a lowering of the non-impact mechanical index is indicated, then the electrical index not tested will be automatically lowered by the same amount and materials may need to be checked after additional aging for retention of flame retardency.

Paragraph 18.4C added (date of publication)

(NEW)
18.4D Reference materials to be considered as the unaltered basic material for application of the limits in Table 18.1, and for use as a control in any required tests, shall be a material that has actually been subjected to thermal aging tests and not a material with an assigned a temperature index based solely on a previous application of this analysis.

Paragraph 18.4D added (date of publication)

(NEW)
18.4E If testing of a related material is not indicated in Table 18.1, the material can be assigned the same temperature rating as the original material.

Paragraph 18.4E added (date of publication)

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APPENDIX F

MEETING OF THE IAC OF UL FOR BASIC PLASTIC MATERIALS AND THE IAG OF UL FOR POLYMERIC INSULATING MATERIALS

ITEM 8. GLOBAL PRODUCTS CLASSIFICATION

LETTER INITIATING DISCUSSION ITEM

GE Plastics

Americas Technology Division
General Electric Company
Agency Services
One Noryl Avenue, Selkirk, NY 12158

May 2, 1996

Underwriters Laboratories Inc.
12 Laboratory Drive
P.O. Box 13995
Research Triangle Park, NC 27709-3995

Attention: Mr. Raffic Ali

Subject: Global Products and Additional Manufacturing Locations

Dear Raffic,

The adoption of the Global Products procedure (Subject 746 - October 25, 1995) now brings us the task of finding a home for the guidelines. What standard are the procedures germane to?

Actually, a case can be made that the guidelines belong in all 746 Standards and UL94. This predicament has lead us to some "out of the box" thinking on how to best manage this situation. Our concluson, ***build a new house***.

We would like to propose the creation of a new standard titled UL746G. This new document would contain the basic requirements for Global Polymeric Materials covered by Underwriters Laboratories Inc. Initially, the scope will be limited to requirements and procedures for Global product recognition and qualification of alternate manufacturing locations. But 746G would provide us flexibility for future growth without affecting the other Polymeric Standards.

A Global Standard will better convey UL and industry commitment to international compliance and demonstrate progressive Global thinking.

We sincerely hope you can support this proposal and add it to the Fall IAC/IAG agenda.

Should you have any questions regarding this matter, please let us know at your earliest convenience. We look forward to hearing from you soon.

Sincerely,

Kilburn (Kibby) L. White, Jr.
Team Leader
Agency Services
Product Recognition Programs

cc: G. Fecthmann-UL Melville
P. Brown-Pittsfield
T. Clinton-Pittsfield

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APPENDIX G

MEETING OF THE IAC OF UL FOR BASIC PLASTIC MATERIALS AND THE IAG OF UL FOR POLYMERIC INSULATING MATERIALS

ITEM 9. DOWNGRADING GUIDELINES

SECOND MEETING OF THE AD HOC COMMITTEE ON DOWNGRADING OF RECOGNITION OF PLASTICS

Underwriters Laboratories Inc.®

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100 a century of public safety est. 1894

May 23, 1996
Subject 746, (94)

TO: P. Bonnaure)
R. deVos)
G. Kirshenbaum) Ad Hoc Committee on
C. Ruiz) Downgrading of Recognitions
K. White) for Plastics

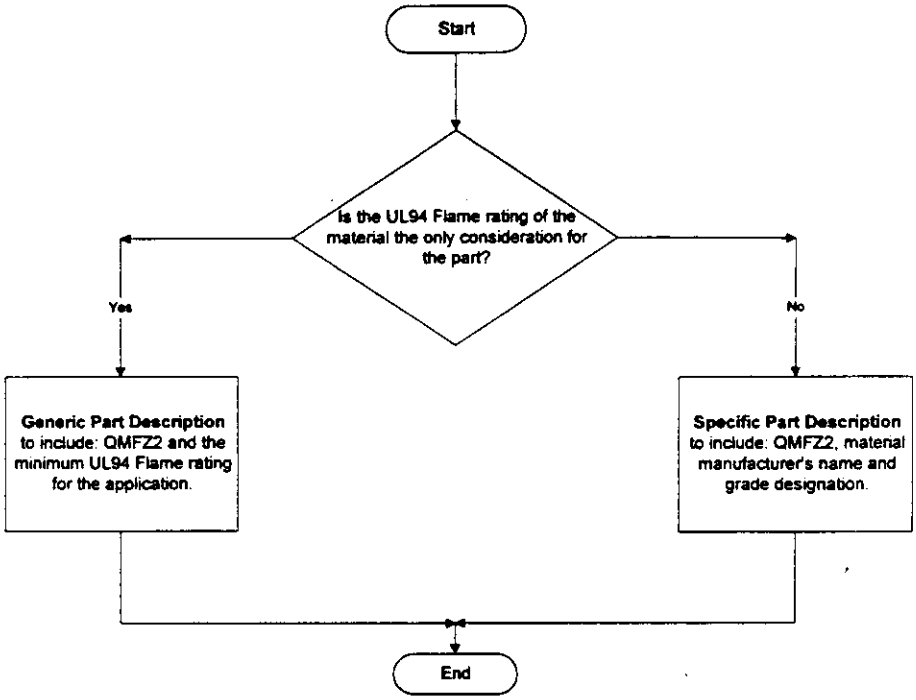
SUBJECT: Second Meeting of the Ad Hoc Committee on Downgrading of Recognitions for Plastics.

The ad hoc Committee on Downgrading of Recognitions for Plastics met for a second time on April 9, 1996 at UL's RTP office. The meeting attendees are listed in Appendix A.

DLS - The status of the UL Document Library System (DLS) was discussed. UL indicated that at the present time only a limited number of product descriptive reports are contained on this database. The conversion of older reports is hampered due to the different word processing programs used by the various UL offices. However, all reports should be converted and included on a new DLS within the next three years. UL indicated that a specific research project proposal for the plastics steering committee, as discussed during the January 24, 1996 ad hoc meeting, would not be made at this time pending completion of the planning of the format of the new DLS. A project proposal will be considered for the September 11, 1996 meeting of the steering committee.

STEPS - UL reviewed several examples of descriptions of plastic parts in end-product FUS Procedures. In some cases, only the minimum required flammability rating was specified. In other cases the material manufacturer's name and grade designation were specified. UL indicated that in the System To Enhance Procedures (STEPS) manual, report writers are instructed to allow the manufacturer as much flexibility as possible. A copy of some of these instructions and examples was distributed and discussed, copy attached in Appendix B.

The committee recommended that UL report writers include only a general description with the minimum UL94 flame rating, if flammability is the only property concern for the plastic part. However, if other properties are also important for the application, such as impact strength or mold-stress relief, then the part description should specifically include the material manufacturer's name and grade designation. The following flowchart was developed to illustrate this recommendation:



Industry representatives recommended that this flowchart and examples of both generic and specific part descriptions be distributed to UL staff responsible for the preparation of product reports. UL indicated that it would consider this proposed announcement for both its Engineering and Follow-Up Services staff.

Downgrading Guidelines - UL presented downgrading guidelines for plastic materials, copy attached. The committee suggested that these be identified as "Existing and interim" as they may not be needed after all reports are on the new DLS. See Appendix C.

Future Actions - The committee agreed that since no additional work is required of them at this time, they will remain on an inactive status. A status report of the

committee's work will be presented at the scheduled September 10, 1996 joint meeting of the Subjects 94/746 IAG/IAC.

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Subjects 746 (94) May 23, 1996

APPENDIX A

ATTENDANCE AT THE SECOND MEETING OF THE AD HOC COMMITTEE ON DOWNGRADING OF RECOGNITIONS FOR PLASTICS

Industry Representatives

Paul Bonnaure	Bayer Corporation
Cathy Ruiz	Allied Signal Inc.
Kibby White	GE Plastics

Invited Guest

Paul Brown	GE Plastics

UL Staff

Raffic Ali (Chairman)	RTP
Robert Crane	RTP
George Fechtmann	Melville

APPENDIX B

Description Reduction

Descriptions should be written to allow as much flexibility to the client as possible. Also, descriptions in many Procedures tend to be too wordy or redundant. The description is a technical report of a product and does not have to be written in complete sentences. In addition, many items are over-described. An example of a product description is shown in Appendix B.

Allow Flexibility - When writing descriptions, allow greater component substitution for construction variance:

A. Recognized or Listed Components - Describe the components (Listed or Recognized) in general terms where appropriate. A few examples of some Recognized Components are: printed wiring boards, TVSS, optical isolators, gasket materials, gauges, and snap switches. Usually the rating of the component is the only pertinent item which needs to be described. In some cases the manufacturer of the component and catalog number are not necessary. For example, the printed wiring board could be described in the following way:

Printed Wiring Board - Recognized Component (ZPMV2), 94V-2, 105°C minimum.

The use of "Any Recognized Component ..." helps eliminate VNs when the client makes use of alternate suppliers. Many times all we need are Recognized Components and the manufacturer and type are not important. To help the client be flexible, we need to make use of generic statements whenever possible.

File E Vol. 1 and Report Sec. 1 Page 8 Issued: Revised:

MODEL ABC - FIG. 5 - (

1. ~~Printed-Wiring-Board---Refer-to-front-part-of-Report-for details.~~

2. Fuse (F1) - Listed, rated 0.5 A, 250 V ac. Secured in nonferrous metal clips with integral end stops by snap fit.

3. Fuse (F2) - Same as Item 2 except rated 10 A, 250 V ac.

4. Insulator - Recognized Component plastic (QMFZ2), , Type or Type 0.3 mm thick, 87.0 by 30.0 mm. Insulate rectifier RC1 and transistors Q1 and Q2 with heat sink.

5. Rectifier (RC1) - Type . Secured by metal clamp and screw. Metal clamp isolated from rectifier by button insulator, see Item 8 for description.

6. Heat Sink - Aluminum, 1.6 mm thick, 273 by 38.1 by 9.5 mm.

7. Transistors (Q1, Q2) - Rated 250 V, 5 A. Secured by metal clamp and screw. Metal clamp isolated from transistors by button insulator, see Item 8 for description.

8. Button Insulator - Seven provided, constructed from Recognized Component plastic (QMFZ2), polyplastic, Type , 2.4 mm.

9. Transistors (Q3, Q4) - Rated 250 V, 5 A. Mounted same as Item 7.

10. Insulator - Recognized Component plastic (QMFZ2), , Type or , Type 0.3 mm (0.12 in.) thick, 57 by 28.5 mm. Provided to insulate transistors, Q3, Q4, Q5 and Q6 from heat sink.

11. Transistor (Q5, Q6) - Same as Item 9.

APPENDIX C

EXISTING AND INTERIM PLASTICS DOWNGRADING GUIDELINES

A Recognized plastic material (QMFZ2) is considered downgraded if any of the following conditions apply:

1. The assigned UL 94 flammability classification is lowered (for example, 94V-2 to 94HB, or 94-5VA to 94-5VB) in any Recognized thickness.

2. The 94-5VA or 94-5VB assigned classification is deleted.

3. Any published "Yellow Card" UL 746A indexing or UL 746B RTI ratings are lowered (for example, a higher PLC number is assigned to the HAI).

4. The published minimum Recognized thickness is increased.

5. Any of the published Recognized colors are deleted.

All downgraded Recognized plastic materials (QMFZ2) are to be identified with a different material designation that can be in the form of an additional prefix or suffix letter or number, unless:

a. the original downgraded rating was not already published in the Recognized Component Directory, or

b. none of the material was shipped from the plastic manufacturer's facilities, or

c. limited number of identified and documented customers.

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APPENDIX H

MEETING OF THE IAC OF UL FOR BASIC PLASTIC MATERIALS AND THE IAG OF UL FOR POLYMERIC INSULATING MATERIALS

ITEM 11. REQUEST TO REVISE UL 94-5V TEST

COPY OF LETTER THAT INITIATED AGENDA ITEM

GE Plastics

Americas Technology Division
General Electric Company
Agency Services
One Noryl Avenue, Selkirk, NY 12158

March 18, 1996

Underwriters Laboratories Inc.
12 Laboratory Drive
P.O. Box 13995
Research Triangle Park, NC 27709-3995

Attention: Mr. Raffic Ali

Subject: UL94 Paragraph 9.1.1.1

Dear Mr. Ali,

GE Plastics would like to propose that the pass/fail criteria for 5V materials be discussed at the fall 1996 combined IAC/IAG UL94/746 committee meeting.

Specifically, we would like to propose that paragraph 9.1.1.1 be deleted and Table 9.1 Material Classifications be amended to reflect that specimens that do burn up to the holding clamp will require additional testing for minimal V1 performance. It should be clearly specified that this additional evaluation is to be conducted at the same thickness as the 5V specimens.

5V materials that do not burn up to the holding clamp (not totally consumed) should not require additional V series testing unless the manufacturer so chooses.

We are requesting this amendment for the following reasons:

1. Manufacturers who produce recognized 5V materials that do not burn up to the holding clamp are being penalized by being mandated to perform additional V series tests.

2. OEM's who choose to use unrecognized resins are not required to do additional V series testing.

3. 9.1.1.1 is misleading, as it implies that 5V materials can drip and ignite cotton. "Materials classified 94-5VA or 94-5VB shall also comply with the requirements described in 8.1-8.6.1 for materials classified 94V-0, 94V-1, and 94V-2."

4. Adding the statement, "After flame or after glow of any specimen up to the holding clamp," along with a footnote stating additional testing is required will harmonize Table 9.1 and Table 8.1 and clearly define the intent of the criteria.

5. Concern about 5V rated materials not having a call-out for electrical requirements has been addressed in UL746C Table 8.1 through footnote a, "Materials classed as 94-5VA and 94-5VB shall be considered with respect to the recommended performance levels of a materials classed as 94V-1."

In principle we support the intent of paragraph 9.1.1.1, but obviously, we feel it is misleading and overly restrictive. We believe the changes recommended best serve the interests of all parties and preserve the safety of the public at large.

Will you kindly let us have your view on this matter at your earliest possible convenience.

Sincerely,

Kilburn (Kibby) L. White, Jr.
Team Leader
Agency Services
Product Recognition Programs

/lm
cc: P. Brown-Pittsfield
O. deBont-Pittsfield
~~W. Fechtmann-UL~~ Melville

PROPOSED REQUIREMENTS ARE OF A TENTATIVE AND EARLY NATURE AND ARE FOR REVIEW AND COMMENT ONLY. CURRENT REQUIREMENTS ARE TO BE USED TO JUDGE A PRODUCT UNTIL THESE REQUIREMENTS ARE PUBLISHED IN FINAL FORM.

APPENDIX I

MEETING OF THE IAC OF UL FOR BASIC PLASTIC MATERIALS AND THE IAG OF UL FOR POLYMERIC INSULATING MATERIALS

ITEM 12. CHARPY IMPACT TEST

TEXT OF PROPOSAL FOR UL 746A, UL 746B AND UL 746C

UL 746A PROPOSALS

9 Tensile Properties of Thermoplastic Polymeric Materials

9.1 The test method for determination of tensile properties of thermoplastic polymeric materials is to be as described in the Standard Test Method for Tensile Properties of Plastics, ANSI/ASTM D 638M-1990 (ISO 527-2-93)[a]. See ASTM D638 for general features of the specimen. While ASTM D 638 Type 1 or ISO 527-2 Type 1 1A specimens are preferred, other type specimens may be used, as appropriate.

Paragraph 9.1 revised (date of publication)

9.2 Values of the maximum tensile strength at either yield or break, and percentage elongation at yield or break can be calculated from the data obtained.

Paragraph 9.2 revised (date of publication)

(NEW)
13A Charpy Impact Test

13A.1 The test method for the determination of the impact energy absorbed in breaking a notched specimen is described in the Standard Test Method for Determination of Charpy Impact Strength of Rigid Materials ASTM (number pending) or ISO 179-1 (non-instrumented) or ISO 179-2 (instrumented)

Paragraph 13A.1 added (date of publication)

13A.2 The test method supports a test specimen as a horizontal beam. The specimen is broken by a single swing of a calibrated pendulum, with the line of impact midway between the supports and directly opposite the notch. The specimen shall be Type 1 with a Type A notch.

Paragraph 13A.2 added (date of publication)

UL 746B PROPOSALS

TABLE 9.1
LIST OF PROPERTIES AND TEST METHODS

Property[a]	Test Method
Mechanical Properties	
Maximum Tensile Stress, and/or Flexural Strength	UL 746A
Tensile, Izod, or Charpy Impact	UL 746A
Electrical Properties	
Dielectric Strength	UL 746A
Flammability Properties	
Vertical Burning	UL 94

[a] The list of properties given in this table is not complete. Other properties that are critical in a particular end-use application are to be included in the program.

(TM-599)

Table 9.1 revised (date of publication)

TABLE 19.1
CONDITIONING BEFORE PROPERTY MEASUREMENT
(Example)

Property		Conditioning
Tensile (flexural) strength Tensile, ~~(IZOD)~~ Izod, or Charpy Impact		Min. 40 h exposure to 50 ±5 percent relative humidity at 23.0 ±3.0°C (73.4 ±5.4°F)
Dielectric Strength[a]	(1)	Min. 40 h exposure to 50 ±5 percent relative humidity at 23.0 ±3.0°C (73.4 ±5.4°F)
	(2)	Min. 96 h exposure to 90 ±5 percent relative humidity at 35.0 ±3.0°C (95.0 ±5.4°F)
Flammability (Material Rated 94V-2 or Better)	(1)	Cooled in desiccators a minimum of 4 hours after oven exposure

[a] The surrounding medium for the dielectric strength test should be air, using shrouded electrodes.

(TM-601)

Table 19.1 revised (date of publication)

TABLE 19.3
NUMBER OF SPECIMENS REQUIRED FOR THERMAL AGING (Example)

Test Material	Test: Property	Test: Method	Thickness mm: ASTM	Thickness mm: ISO	Specimens: Number per Set	Specimens: Number for Initial Tests	Specimens: Number for All Temperatures	Specimens: Number for UL Referee Test[b]	Specimens: Total
Candidate (proposed)	Tensile (flexural) strength	UL 746A	3.2	4.0	5	10	220	60	290
			1.6	2.0	5	10	110	—	120
			0.8	1.0	5	10	110	—	120
	Tensile (Izod) impact	UL746A	3.2	4.0	5	10	220	60	290
			1.6	2.0	5	10	110	—	120
			0.8	1.0	5	10	110	—	120
	Dielectric strength	UL746A	0.8		10	20	440	—	460
	Flammability (Materials Rated 94V-2 or better)	UL94	MT[a]		20	20	100	20	140
Control (known)	Tensile (flexural) strength	UL746A	3.2	4.0	5	10	220	60	290
	Tensile, ~~(Izod)~~ Izod, or Charpy impact	UL746A	3.2	4.0	5	10	220	60	290
	Dielectric strength	UL746A	0.8		10	20	440	—	460

[a] MT represents the minimum thickness evaluated, usually 0.8 mm.

[b] These specimens are only required if a UL referee test is considered necessary.

(TM-603)

Table 19.3 revised (date of publication)

TABLE 19.4
NUMBER OF SPECIMENS REQUIRED FOR A TYPICAL
POLYPROPYLENE THERMAL AGING PROGRAM

Test Material	Test Property	Test Method	Thickness mm ASTM	Thickness mm ISO	Specimens Number per Set	Specimens Number for Initial Tests	Specimens Number for All Temperatures (Sets A and B)	Specimens Total
Candidate (proposed)	Tensile strength	UL746A	3.2	4.0	10	10	80	90
	Tensile or Charpy impact	UL746A	3.2	4.0	10	10	80	90
			1.6	2.0	10	10	40	50
	Dielectric strength	UL746A	1.6	2.0	5	10	20	30
	Flammability (Materials Rated 94V-2 or better)	UL 94	MT[a]		5	10	20	30
Control (known)	Tensile strength	UL746A	3.2	4.0	10	10	80	90
	Tensile or Charpy impact	UL746A	3.2	4.0	10	10	80	90

[a] MT represents the minimum thickness evaluated.

Table 19.4 revised (date of publication)

UL 746C PROPOSALS

Table 58.1
Physical-property test methods

Physical-property consideration	Material test method	
	Thermoplastics	Thermosets
Functional support	Tensile strength[c]	Flexural strength[a,b]
Impact resistance	Tensile impact[b] or Charpy impact[b]	Izod impact[b] or Charpy impact[b]

[a] The ultraviolet-exposed side is to be in contact with the two loading points when using the three-point loading method.

[b] Tests conducted on the 3.2 mm (1/8 inch) thick specimens for Tensile and Izod impact and 4.0 mm for Charpy impact are considered representative of other thicknesses, down to 1.6 mm (1/16 inch).

[c] For the tensile strength test, tests conducted on the 3.2 mm x 13 mm (1/8 inch) or 4.0 mm x 10 mm thick specimens are considered representative of other thicknesses, down to 0.8 mm (1/32 inch).

Table 58.1 revised (date of publication)

59.2 The following properties shall be included in the evaluation (See Table 58.1):

a) For thermoplastics, as described in the Standard for Polymeric Materials – Short Term Property Evaluations, UL 746A,

1) Tensile Strength.

2) Tensile Impact or Charpy Impact.

b) For thermosets, as described in the Standard for Polymeric Materials – Short Term Property Evaluations, UL 746A,

1) Flexural Strength.

2) Izod Impact or Charpy Impact.

c) Flammability, as described in the requirements for tests for flammability of plastic materials for parts in devices and appliances, UL 94. See 58.2.3 – 58.2.7, and Table 58.1.

Paragraph 59.2 revised (date of publication)

59.3 Tensile Strength Tests conducted on 3.2 mm x 13 mm (1/8 inch nominal thickness) or 0.4 mm x 10 mm thick specimens are considered representative of other thicknesses, down to 0.8 mm (1/32 inch).

Paragraph 59.3 revised (date of publication)

PROPOSED REQUIREMENTS ARE OF A TENTATIVE AND EARLY NATURE AND ARE FOR REVIEW AND COMMENT ONLY. CURRENT REQUIREMENTS ARE TO BE USED TO JUDGE A PRODUCT UNTIL THESE REQUIREMENTS ARE PUBLISHED IN FINAL FORM.

APPENDIX J

MEETING OF THE IAC OF UL FOR BASIC PLASTIC MATERIALS AND THE IAG OF UL FOR POLYMERIC INSULATING MATERIALS

ITEM 15. UL 746C, FIGURE 5.1 - PROPOSED REVISION

COPY OF LETTER THAT INITIATED DISCUSSION ITEM

U.S. CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, D.C. 20207
July 5, 1996

Mr. George J. Fechtmann
Associate Managing Engineer
Underwriters Laboratories Inc.
1285 Walt Whitman Road
Melville, NY 11747-4824

Re: Standard for Safety, UL 746C, Polymeric Materials - Use in Electrical Equipment Evaluations

Dear Mr. Fechtmann:

This letter presents a proposal to UL regarding polymeric (plastic) enclosure requirements for portable appliances. The proposal is to revise Part 1 of Figure 5.1 of the subject standard to route the "yes" alternative from the "is equipment portable" decision box directly to the decision box that contains the question: Is equipment for attended intermittent duty household use? This would eliminate the "Is material used to enclose uninsulated live parts or live parts with insulation thickness less than 0.71 mm (0.028 inch) thickness?" decision box and its "no" alternative (along with the column headed "94HB or 94V" in Part 2.

The impact of this change would be that merely insulating internal live parts with insulation thickness 0.71 mm (0.028 inch) or greater would not qualify for reduced portable appliance enclosure requirements.

The recommended change to the standard is based on the experience of the CPSC engineering staff in examining household electrical products that have suffered internal component failures. These failures often involve insulated component parts that have led to overheating, arcing and, in some cases, ignition of the component itself. These conditions become a fire hazard when the appliance's enclosure ignites. This scenario is one that we have seen again and again with certain polymeric enclosure materials in a variety of household electrical appliances. Descriptions of two recent cases where insulation thickness alone did not adequately protect portable equipment are enclosed to support this proposal.

The proposed change would still permit consideration of enclosure materials having 94HB and 94V flammability ratings, but would tighten the requirements to the extent that material property tests currently in the standard would apply in more situations. We cannot identify a technical basis for the allowance presently permitted by Figure 5.1. In some cases,

the component insulation itself (which far exceeded the minimum 0.71 mm thickness) ignited as a consequence of the component failure, and brought flame to the appliance enclosure.

This proposal is consistent with our previously expressed concerns about applications of polymeric materials in electrical appliances and equipment, and represents one step in the process of addressing those concerns.

Thank you for the opportunity to make this proposal. It represents the view of the technical staff of the Commission, and does not necessarily represent the official position of the Consumer Product Safety Commission.

Sincerely,

William H. King, Jr.
Director
Division of Electrical Engineering

Enclosures

cc: Bob Davidson, UL - Melville
James Beyreis, UL - Northbrook
Colin Church, CPSC Voluntary Standards Coordinator
Ed Krawiec, CPSC Engineering Laboratory

Portable Electric Space Heater

Product: Portable electric heater manufactured in [redacted]. A tag on the bottom of the unit included the manufacturer's name, model number, 120V, 60HZ, 1500 WATTS, 13A, AC ONLY, UL listed.

A tag on the top of the unit reads: "CAUTION - HIGH TEMPERATURES, KEEP ELECTRICAL CORDS, DRAPES, AND OTHER FURNISHINGS AWAY FROM HEATER".

The unit involved in the fire incident had been purchased new and was used satisfactorily for approximately 6 months as a daily supplementary heat source.

Background: On the day of the incident, the victim had been using the unit approximately one hour, on the floor of his living room, when he noticed smoke issuing from the heater. The heater was set on high and was plugged directly into a wall receptacle, which had no other service on it. He was not sure where the smoke was coming from, but thought "maybe somewhere near the fan motor".

He shut the unit off and unplugged the unit from the wall receptacle. It continued to smoke, so he placed it outside on his deck. The unit ignited, so he put it into a snow bank, where it continued to burn until he buried it with snow. There were no injuries during this incident.

Summary of Engineering Investigation: Evaluated the portable space heater that had been involved in the fire incident. Three additional new samples of this same model in their original boxes with instructions were also evaluated. An incident report was reviewed.

The incident unit was badly burned in the upper right hand corner on the face of the unit, and the far right side of the top of the unit. The control switch had been completely burned away. At some period, the unit was on its back, which resulted in a small portion of the back of the unit also being burned. Most of the damage on the back of the unit was caused from the molten plastic boring its way through the housing. A continuity test revealed that the thermal cutoff did not open at the time of the incident.

A general examination was performed on all samples to determine if any defective wiring or poor component positioning was present. The switch on one of the new samples was opened and analyzed to determine its construction.

After the general examination, an electrical resistance test was performed on all of the new units to determine any abnormal resistances, especially around the switch connections. There were no abnormal resistances found in the new units.

Operating characteristics tests were performed on two of the new

samples to determine the operating tendencies of the heating coils, control switch, and thermal devices. The tests revealed that when the units were energized at either of the two settings, they reached a steady state temperature that is below the thermostat and thermal cutout ratings. Also, the fan slowed considerably as the heater coils were energized. The tests further revealed that the thermal devices, which are located in the center of the coils, saw higher temperatures when the front cover was removed. All tested units operated properly in all switch positions and no overheating occurred.

Samples of the plastic housing were then subjected to a vertical burning test to determine the flammability of the plastic. The total burn time of the 5 samples after 10 applications of flame was ~ 7 seconds. The samples fall under the classification of 94V-2 type plastic, per paragraph 3.3 of U.L. 94. However, U.L.'s requirement for plastic used as an enclosure for this type portable electric space heater is not known.

The visual examination was performed on the third new sample. When the control switch was dissected, it was observed that the wires which were inserted into the control switch were poorly tinned. One of the wires in the control switch was frayed. It was not possible to test this unit after the control switch had been dissected.

The switch is a rotary type. There are four settings on the switch: off, fan, 750 watts, and 1500 watts. The switch is designed such that the fan must be operating in order for either of the heating elements to operate. The switch is marked with the Canadian Standards Approval mark and the U.L. Recognized Component mark. The rating of the switch is imprinted on the unit and is as follows: "3A-240V.A.C. 6A-120V.A.C. 13A 120V.A.C. (H) 1/4H.P.-120-240V.A.C."

The unit is supplied power via a 2 conductor insulated appliance cord, marked "16AWG" and is terminated with a two-prong polarized plug.

The visual examination also revealed a problem with a bracket that pinches the power cord between two sharp corners. This causes a severe indentation in the insulation of the power cord. If this cord is pulled from the outside of the unit, the insulation would be further damaged, thus exposing the conductors, which could result in a short circuit. This, however, does not appear to be the problem with the burned unit.

Post visual examination of all of the units revealed poor connections between the wires and the spring contacts in the control switch. The spring contacts make connections to the wires at an ~ 45 degree angle. There is not enough surface area of the inserted wire making contact with the spring connector within the switch. This can potentially create a highly resistive contact, which would result in overheating within the

control switch enclosure. This is significant because the fire that started in the burned unit appears to have started in the control switch area. Therefore, it is probable that the junction at the spring connectors, where the wires are inserted into the control switch, were the source of heat for the fire.

The burned unit was extensively damaged in the fire. The heating coils, fan motor, and power cord do not appear to be the cause. It appears the fire started in the area of the control switch.

Although there were no hot spots on the tested units, it is likely that the space heater caught fire due to the poor connections at the control switch.

Discussion: One of the four combination wire contact/switch contact arms in the incident heater switch shows substantial localized melting. The damage is limited to the wire contact portion of the arm and could only have been caused by electrical arcing. In contrast, neither of the three other contact arms nor the moving contact ring of the switch had suffered similar damage. It is not likely that the single contact arm suffered the arcing damage as a consequence of the switch being heated by a flame from an ignition source located below, e.g., an element termination, since the relatively small size of the thermoplastic switch body would have resulted in more that one contact interface parting and arcing during such an event.

Although the basic design of the switch is a type used by electric heater and fan manufacturers for years, two weaknesses in the specific switch were noted. One weakness is the "push-in" type of wire termination. The second weakness is the substitution of thermoplastic for thermoset materials in the switch body and operating shaft.

Conclusion: An insulated live part failed and ignited the appliance enclosure of a portable electric heater.

This summary prepared 6/96 from file materials.

Portable Electric Oscillating Fan

Product: Portable electric oscillating fan, rated 120v, UL listed.

Background: A portable, oscillating electric fan, which had been in use continuously for a 3 year period in a university hospital emergency room, suddenly started on fire. A hospital emergency room technician put the fire out with a fire extinguisher prior to the fire department arrival. There was no damage to property. The technician was treated in the emergency room for smoke inhalation. The damaged fan was collected as a CPSC sample.

Summary of Engineering Investigation: The fan's thermoplastic enclosure is moderately damaged and the rotor of the motor is bound by melted materials from the enclosure.

Wiring was chafed from oscillation, of being pulled recurrently across a corner of the metal motor housing until friction abraded bare the conductor. The conductor contacted the grounded metal motor housing creating a short circuit condition. Sparking and intense heat were generated at the point of the short, igniting the wiring insulation, putting flame against the enclosure. Fire damage of the plastic enclosure around the motor housing took place in the area where the wire insulation was completely lost. There was no damage at other locations on the product.

There was no damage to the motor winding, and the motor bearings remain serviceable; no evidence of self-induced heating. It was concluded that a locked rotor condition did not start the fire.

The switch contacts and connections showed no evidence of overheating.

The power cable and the wiring in the base were in perfect condition and there was no evidence of fire or smoke. There was no sign of a malfunction in the fan's base.

Conclusion: The base assembly showed no evidence of the fire except for a hole apparently produced by melted materials dropping from the motor enclosure. The motor windings were in good condition except at the rear where the external wiring was attached and was damaged by fire. Splices were secure inside twist-on insulated wire connectors. The failure was obviously caused by wiring to a suspended circuit element abrading against an edge of the grounded motor frame, due to the oscillations of the fan. After the insulation was abraded, arcing developed between a wire and a corner of the motor frame, leading to the fire.

This summary prepared 6/96 from file materials.

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APPENDIX K

MEETING OF THE IAC OF UL FOR BASIC PLASTIC MATERIALS AND THE IAG OF UL FOR POLYMERIC INSULATING MATERIALS

ITEM 21. UL 94 - EDITORIAL CORRECTIONS

TEXT OF PROPOSED REVISIONS FOR UL 94

5.4 Burner Mounting Fixture — Capable of positioning the burner at an angle of 20 ±5 degrees from the vertical axis. (Used for the test procedure in 500 w Vertical Burning Test: 94-VA or 94-5VB Section 9 only.)

Paragraph 5.4 revised (date of publication)

5.8 Gas Supply — A supply of technical grade methane gas (min. 98 percent pure) with regulator and meter for uniform gas flow.

Note: Natural gas having a heat content of approximately 37 ±1 MJ/m^3 has been found to provide similar results. However, technical grade methane shall be used in case of dispute.

Paragraph 5.8 revised (date of publication)

7.5 Procedure

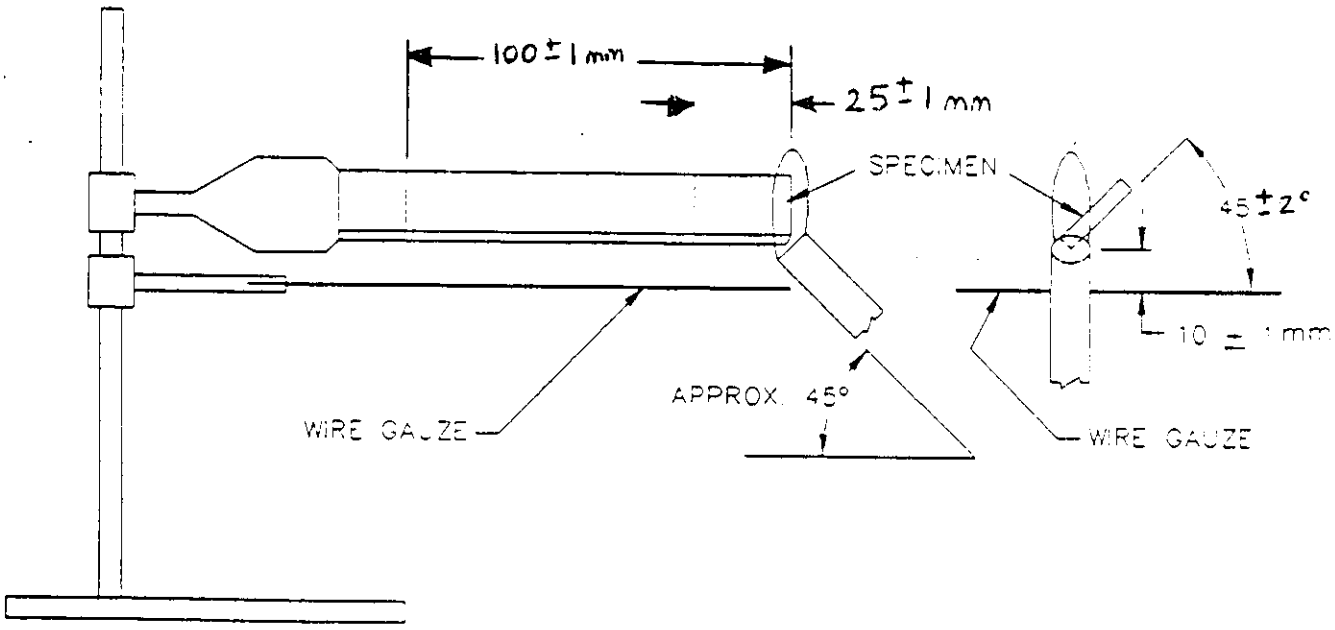
7.5.1 Three specimens are to be tested. Each specimen is to be marked with two lines perpendicular to the longitudinal axis of the bar, 25 ±1 mm and 100 ±1 mm from the end that is to be ignited.

Paragraph 7.5.1 revised (date of publication)

7.5.2 Clamp the specimen at the end farthest from the 25 mm mark, with its longitudinal axis horizontal and its transverse axis inclined at 45 ±2 degrees. The wire gauze is to be clamped horizontally beneath the specimen, with a distance of 10 ±1 mm between the lowest edge of the specimen and the gauze with the free end of the specimen even with the edge of the gauze. See Figure 7.1.

Paragraph 7.5.2 revised (date of publication)

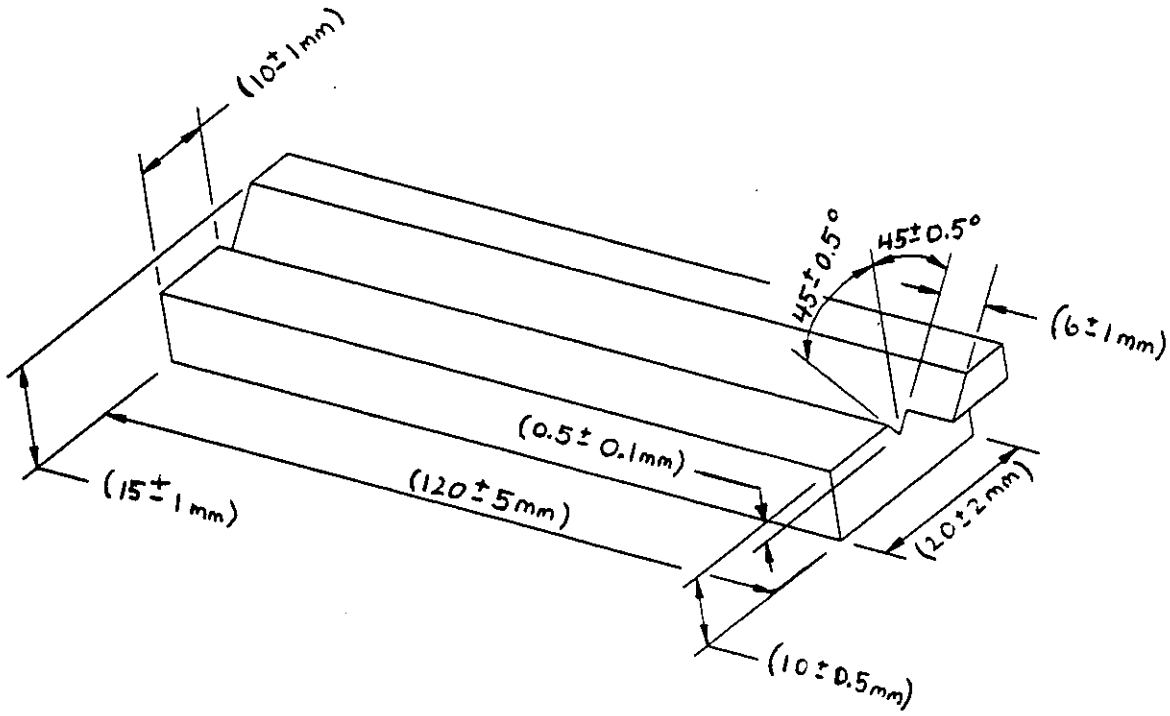
Figure 7.1
Horizontal burning test for 94HB classification



FT120C (MODIFIED)

Figure 7.1 revised (date of publication)

Figure 7.2
Flexible specimen support fixture



FT220A (MODIFIED)

Figure 7.2 revised (date of publication)

11.3 Test Specimens

11.3.1 Test specimens are to be cut from sheet material or film to a size 200 ± 5 mm in length by 50 ± 1 mm in width, in the minimum and maximum thicknesses that are to be tested covering the thickness range under consideration. Specimens in intermediate thicknesses are also to be provided and may be tested if the results obtained on the minimum and/or maximum thicknesses indicated a need.

Paragraph 11.3.1 revised (date of publication)

12.3.2 Standard test specimens are to be 150 ± 5 mm long by 50 ± 1 mm wide, in the minimum and maximum thicknesses covering the thickness range to be considered. Specimens tested by this method are limited to a maximum thickness of 13 mm. Specimens in intermediate thicknesses are also to be provided and may be tested if the results obtained on the minimum and/or maximum thickness indicate a need. Intermediate thicknesses are not to exceed increments of 6 mm. The maximum width is not to exceed 50 mm. The edges are to be smooth and the radius on the corners is not to exceed 2 mm.

Paragraph 12.3.2 revised (date of publication)

PROPOSED REQUIREMENTS ARE OF A TENTATIVE AND EARLY NATURE AND ARE FOR REVIEW AND COMMENT ONLY. CURRENT REQUIREMENTS ARE TO BE USED TO JUDGE A PRODUCT UNTIL THESE REQUIREMENTS ARE PUBLISHED IN FINAL FORM.

APPENDIX L

MEETING OF THE IAC OF UL FOR BASIC PLASTIC MATERIALS AND THE IAG OF UL FOR POLYMERIC INSULATING MATERIALS

ITEM 22. PLC'S FOR HOT WIRE IGNITION TEST

COPY OF LETTER THAT INITIATED AGENDA DISCUSSION ITEM

DSM

Branch Management Electrical & Electronics
Polymer Applications
Oude Postbaan, Geleen
P.O. Box 604, 6160 AP Geleen, The Netherlands

DSM

Telefax

To:	
Company	Underwriters Laboratories Inc. - RTP
For the attention of	**Mr. Raffic Ali - Chairman of IAG 746(94)**
Copy to	
Telefax number	5 00 1 919 549 1531
Date	July 12,1996
Number of pages	3
Subject	PLC levels - Hot Wire Ignition
Reference	AS/96126/MdV
From:	
Name	M.C. de Vos
Direct telephone line	+31 46 4670176
Direct telefax line	+31 46 4670796

Dear Mr. Ali,

We like to ask your attention for the problem we experienced using the material Performance Level Category (PLC) after conducting the Hot Wire Ignition Test according to UL 746A.

Please be so kind to discuss this problem during the September '96 meeting of IAG 746(94).

1. Introduction

According to Subclause 30.1.1 of UL 746A the test method for the determination of resistance to ignition of plastic materials from an electrically heated wire is described in the Standard Test Method for Ignition of Materials by Hot Wire Sources, ASTM D 3874.

The scope of ASTM D 3874 under 1.1 says: "This test method is intended to differentiate, among materials with respect to their resistance to ignition".

Subclause 3.1 of ASTM D 3874 says that this test is intended to determine the relative resistance of insulating materials to ignition.

Subclause 3.2 of ASTM D 3874 says: "the test method determines the average time in seconds required for ignition of specimens".

DSM
Branch Management Electrical & Electronics
Polymer Applications

DSM

According to Subclause 30.1.3 of UL 746A the PLC level to be assigned shall be based on the determined mean time for ignition (seconds).

Also according to the International Standard IEC 695-2-20:1995 this test method is intended to provide a relative comparison of the behaviour of various materials according to the time taken to ignite the specimen during application of heat from an electrically heated coil as an ignition source.

For specimen that melt through the wire without ignition the test shall be discontinued when the specimen is no longer in intimate contact with all five turns of the heater wire.

2. Requirements in International End-product Standards

In IEC 950:1991 - Information Technology Equipment and in IEC 947-1 (to be published this year) - Industrial Switchgear and Controlgear the described Hot Wire Ignition is used to define a requirement for insulating materials. In both standards the requirement is only based on the time to ignition of the specimen under test.

3. Problem

Our problem now is the way UL is determining the PLC levels.

According to the Plastics Recognized Component Directory (page 5) the Performance is expressed as the mean number of seconds needed to either ignite standard specimen or to burn through the specimen without ignition.

In case the specimen are burned through without ignition we are in fact dealing with melting through without ignition.

We believe that it is incorrect to consider the time at which the test is discontinued due to melting through without ignition as the time to get ignition. Doing this, UL is assigning PLC levels not in accordance with UL 746A and so the PLC levels are incorrect.

4. Proposal

In case melting through without ignition occurs no PLC level based on ignition, or a PLC 0 should be assigned, because in the present situation users of the UL publications are informed incorrectly about the behaviour of the material tested.

A solution could be to assign a PLC level indication from which the user of the UL Publications clearly can see how the material performed during the Hot Wire Ignition test.

Best Regards,

Rinus de Vos